

RF power transistor, LdmoST family N-channel enhancement-mode lateral MOSFETs

Datasheet — production data

Features

- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 15\text{ W}$ with 11 dB gain @ 2 GHz / 13.6 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC European directive

Description

The PD20015-E is a common source N-channel, enhancement-mode lateral field-effect RF power transistor. It is designed for high gain, broadband commercial and industrial applications. It operates at 13.6 V in common source mode at frequencies of up to 1 GHz. PD20015-E boasts the excellent gain, linearity and reliability of ST's latest LDMOS technology mounted in the first true SMD plastic RF power package, PowerSO-10RF. PD20015-E's superior linearity performance makes it an ideal solution for mobile radio applications.

The PowerSO-10 plastic package, designed to offer high reliability, is the first ST JEDEC approved, high power SMD package. It has been specially optimized for RF needs and offers excellent RF performances and ease of assembly.

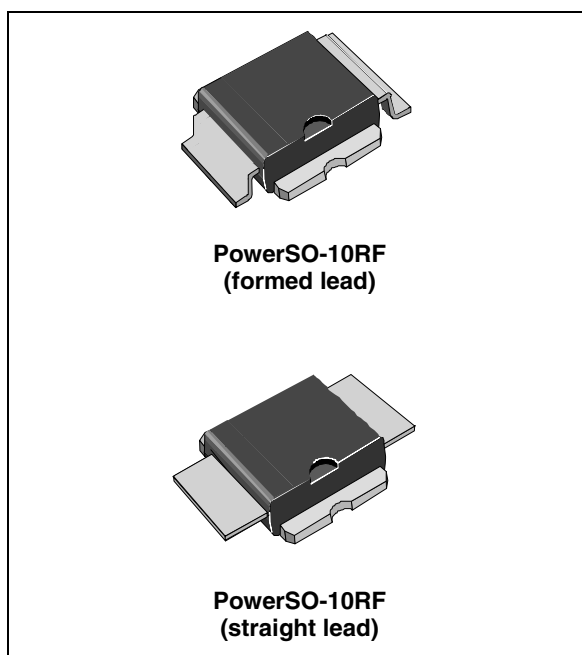


Figure 1. Pin connection

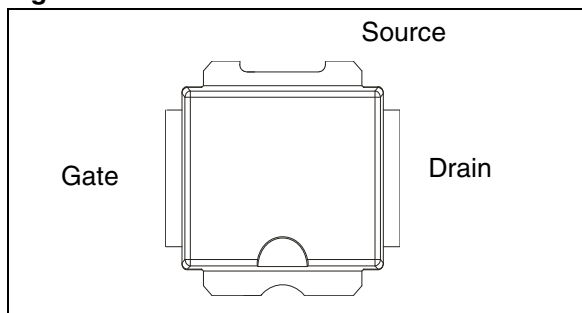


Table 1. Device summary

Order codes	Package	Packing
PD20015-E	PowerSO-10RF (formed lead)	Tube
PD20015TR-E	PowerSO-10RF (formed lead)	Tape and reel
PD20015STR-E	PowerSO-10RF (straight lead)	

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1 Electrical data

1.1 Maximum ratings

$T_{\text{CASE}} = 25\text{ °C}$

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source voltage	40	V
V_{GS}	Gate-source voltage	-0.5 to +15	V
I_{D}	Drain current	7	A
P_{DISS}	Power dissipation (@ $T_{\text{C}} = 70\text{ °C}$)	79	W
T_{J}	Max. operating junction temperature	165	°C
T_{STG}	Storage temperature	-65 to +150	°C

1.2 Thermal data

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Junction - case thermal resistance	1.2	°C/W

2 Electrical characteristics

$T_{CASE} = +25\text{ }^{\circ}\text{C}$

2.1 Static

Table 4. Static

Symbol	Test conditions			Min.	Typ.	Max.	Unit
I_{DSS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}$		-		1	μA
I_{GSS}	$V_{GS} = 5\text{ V}$	$V_{DS} = 0\text{ V}$		-		1	μA
$V_{GS(Q)}$	$V_{DS} = 10\text{ V}$	$I_D = 350\text{ mA}$		3.2		4.8	V
$V_{DS(ON)}$	$V_{GS} = 10\text{ V}$	$I_D = 1\text{ A}$		-	0.27	0.31	V
C_{ISS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 12.5\text{ V}$	$f = 1\text{ MHz}$	-	55		pF
C_{OSS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 12.5\text{ V}$	$f = 1\text{ MHz}$	-	40		pF
C_{RSS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 12.5\text{ V}$	$f = 1\text{ MHz}$	-	1.5		pF

2.2 Dynamic

Table 5. Dynamic

Symbol	Test conditions			Min.	Typ.	Max.	Unit
P3dB	$V_{DD} = 13.6\text{ V}$, $I_{DQ} = 350\text{ mA}$	$f = 2\text{ GHz}$			23	-	W
G_P	$V_{DD} = 13.6\text{ V}$, $I_{DQ} = 350\text{ mA}$, $P_{OUT} = 15\text{ W}$	$f = 2\text{ GHz}$		10	11	-	dB
h_D	$V_{DD} = 13.6\text{ V}$, $I_{DQ} = 350\text{ mA}$, $P_{OUT} = P_{3dB}$	$f = 2\text{ GHz}$		45	53	-	%
Load mismatch	$V_{DD} = 15.5\text{ V}$, $I_{DQ} = 350\text{ mA}$, $P_{OUT} = 20\text{ W}$, $f = 2\text{ GHz}$ all phase angles			20:1		-	VSWR

2.3 ESD protection characteristics

Table 6. ESD protection characteristics

Test conditions	Class
Human body model	2
Machine model	M3

2.4 Moisture sensitivity level

Table 7. Moisture sensitivity level

Test methodology	Rating
J-STD-020B	MSL 3

3 Impedance

Figure 2. Current conventions

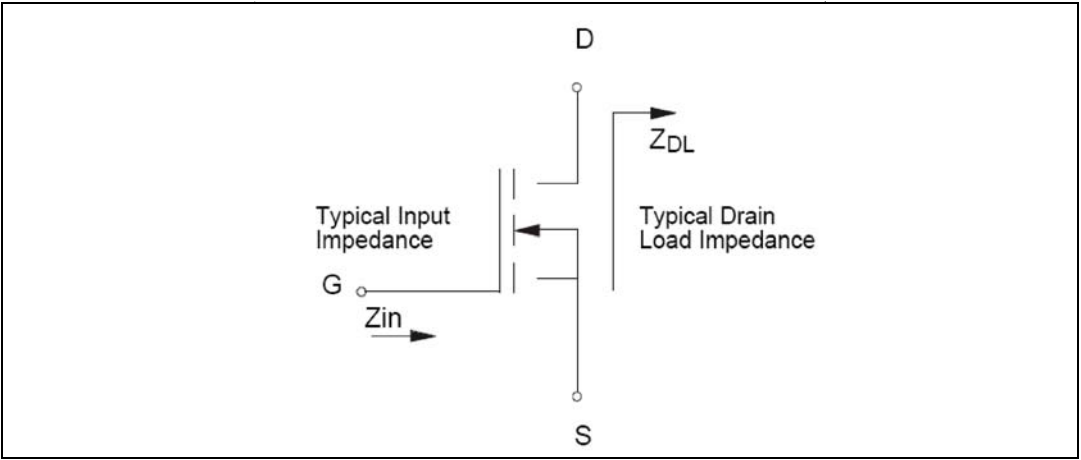


Table 8. Impedance data

Freq. (MHz)	$Z_{IN} (\Omega)$	$Z_{DL} (\Omega)$
2000	$0.45 + j0.99$	$0.99 - j0.9$

4 Typical performance

Figure 3. Capacitances vs drain voltage

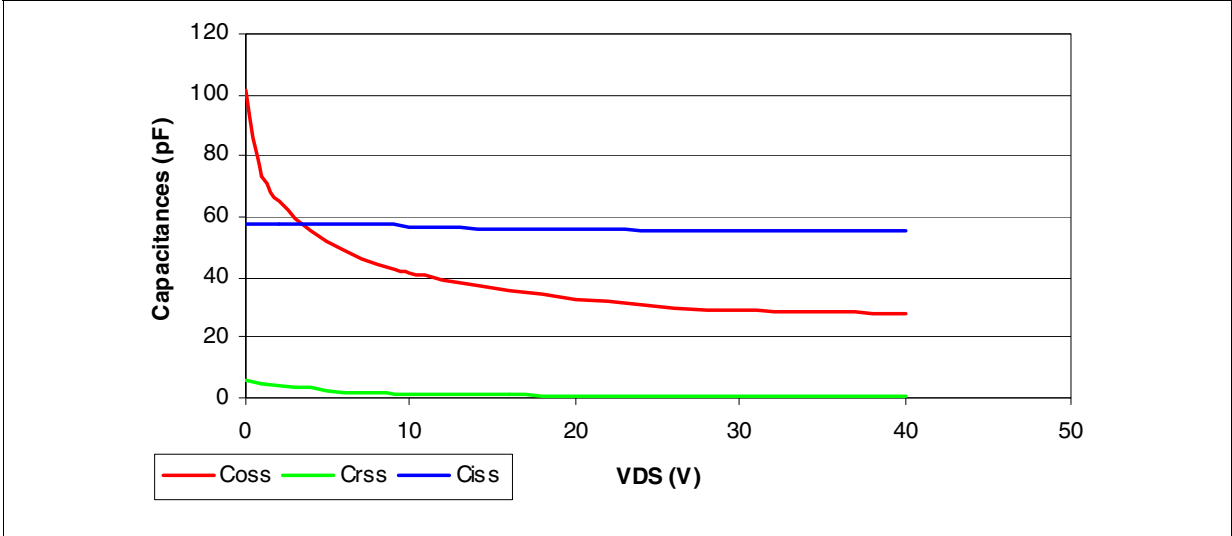


Figure 4. DC output characteristics

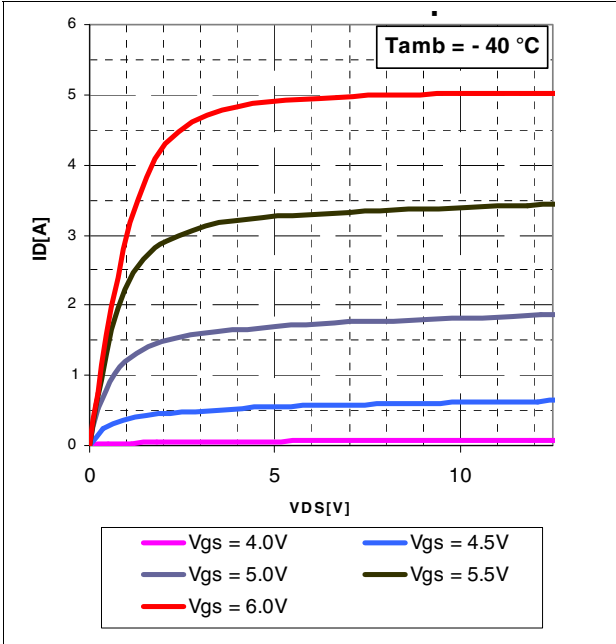


Figure 5. DC output characteristics

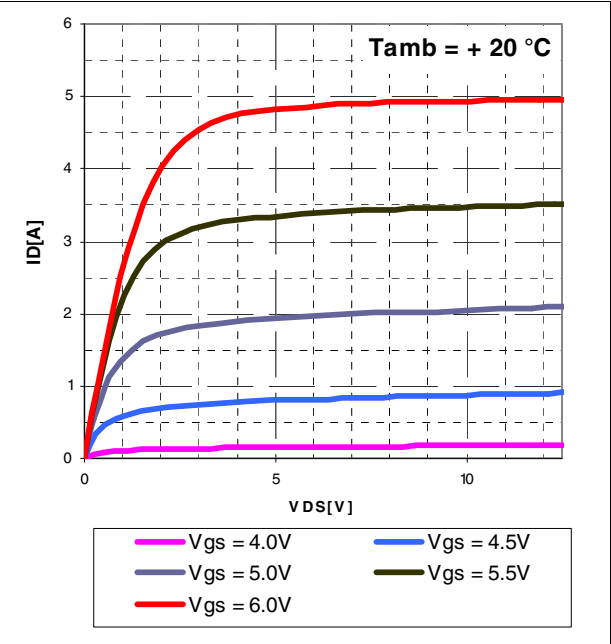


Figure 6. DC output characteristics

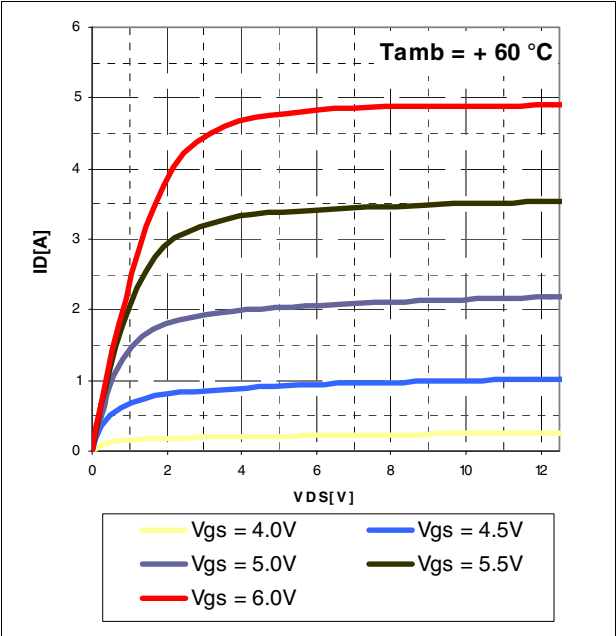


Figure 7. Gain and efficiency vs P_{OUT}

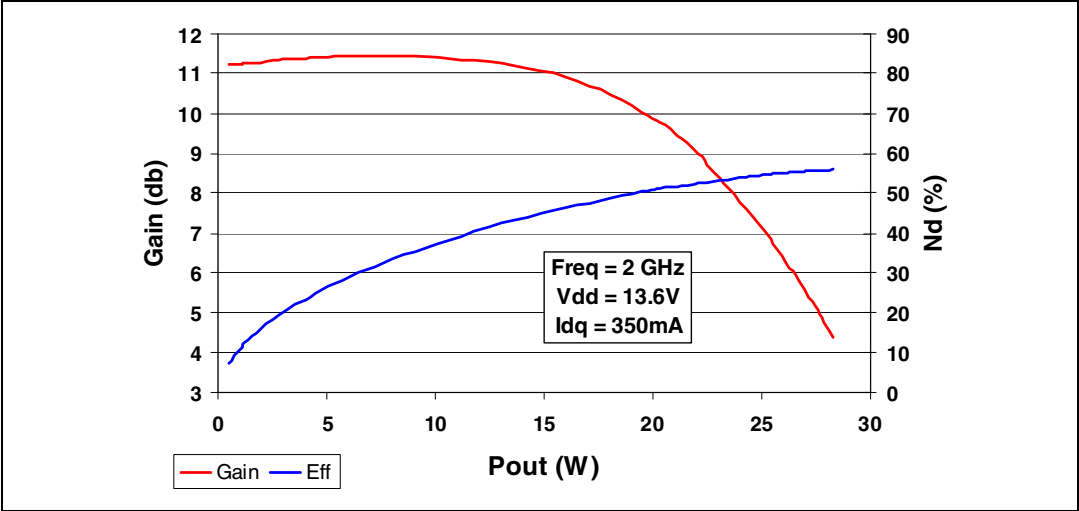
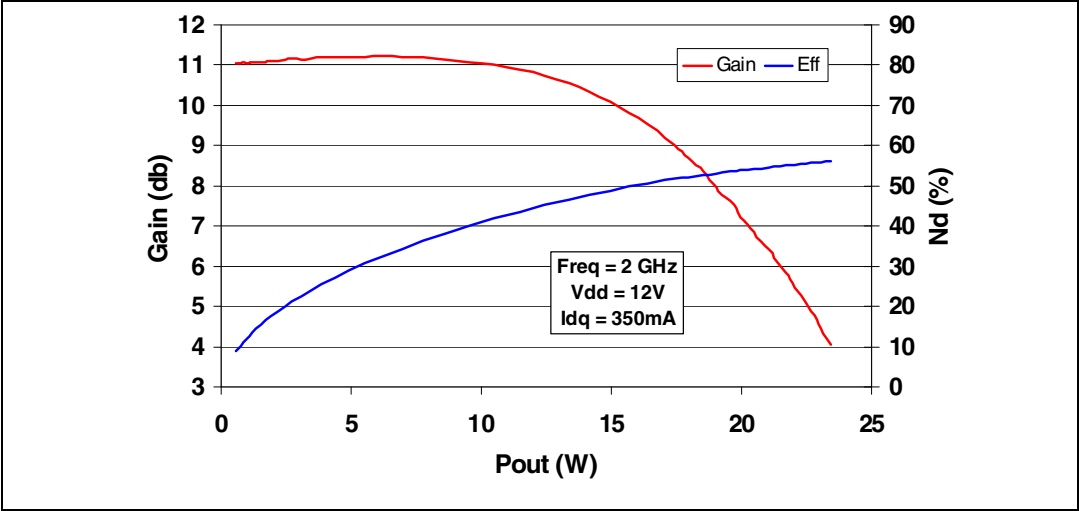


Figure 8. Gain and efficiency vs P_{OUT}



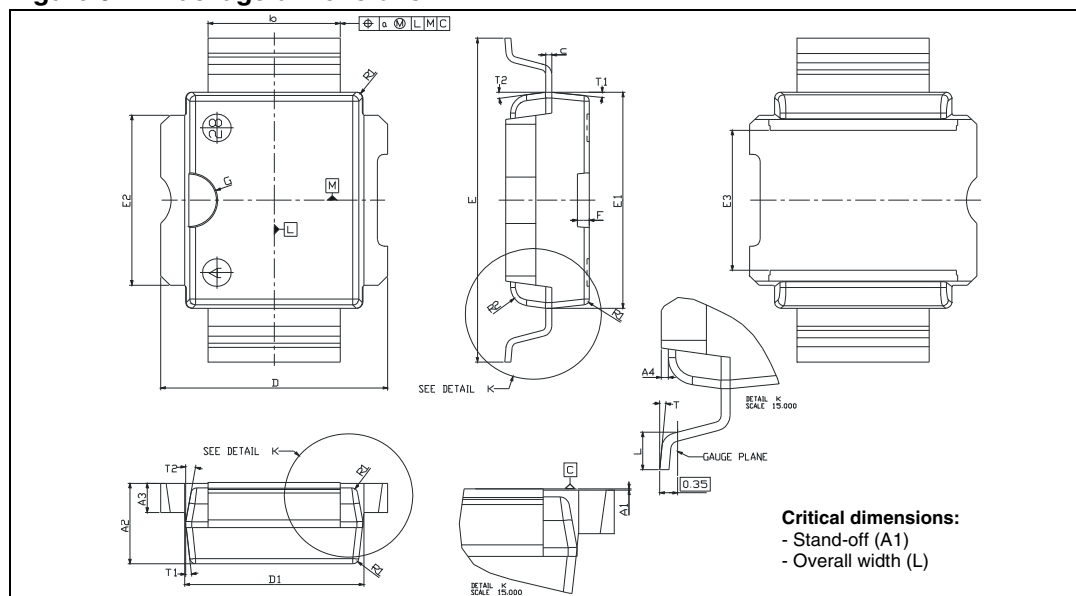
5 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

Table 9. PowerSO-10RF formed lead (gull wing) mechanical data

Dim.	mm.			Inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A1	0	0.05	0.1	0.	0.0019	0.0038
A2	3.4	3.5	3.6	0.134	0.137	0.142
A3	1.2	1.3	1.4	0.046	0.05	0.054
A4	0.15	0.2	0.25	0.005	0.007	0.009
a		0.2			0.007	
b	5.4	5.53	5.65	0.212	0.217	0.221
c	0.23	0.27	0.32	0.008	0.01	0.012
D	9.4	9.5	9.6	0.370	0.374	0.377
D1	7.4	7.5	7.6	0.290	0.295	0.298
E	13.85	14.1	14.35	0.544	0.555	0.565
E1	9.3	9.4	9.5	0.365	0.37	0.375
E2	7.3	7.4	7.5	0.286	0.292	0.294
E3	5.9	6.1	6.3	0.231	0.24	0.247
F		0.5			0.019	
G		1.2			0.047	
L	0.8	1	1.1	0.030	0.039	0.042
R1			0.25			0.01
R2		0.8			0.031	
T	2 deg	5 deg	8 deg	2 deg	5 deg	8 deg
T1		6 deg			6 deg	
T2		10 deg			10 deg	

Note: Resin protrusions not included (Max. value: 0.15 mm per side)

Figure 9. Package dimensions**Table 10. PowerSO-10RF straight lead mechanical data**

Dim.	mm.			Inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A1	1.62	1.67	1.72	0.064	0.065	0.068
A2	3.4	3.5	3.6	0.134	0.137	0.142
A3	1.2	1.3	1.4	0.046	0.05	0.054
A4	0.15	0.2	0.25	0.005	0.007	0.009
a		0.2			0.007	
b	5.4	5.53	5.65	0.212	0.217	0.221
c	0.23	0.27	0.32	0.008	0.01	0.012
D	9.4	9.5	9.6	0.370	0.374	0.377
D1	7.4	7.5	7.6	0.290	0.295	0.298
E	15.15	15.4	15.65	0.595	0.606	0.615
E1	9.3	9.4	9.5	0.365	0.37	0.375
E2	7.3	7.4	7.5	0.286	0.292	0.294
E3	5.9	6.1	6.3	0.231	0.24	0.247
F		0.5			0.019	
G		1.2			0.047	
R1			0.25			0.01
R2		0.8			0.031	
T1		6 deg			6 deg	
T2		10 deg			10 deg	

Note: Resin protrusions not included (Max. value: 0.15 mm per side)

Figure 10. Package dimensions

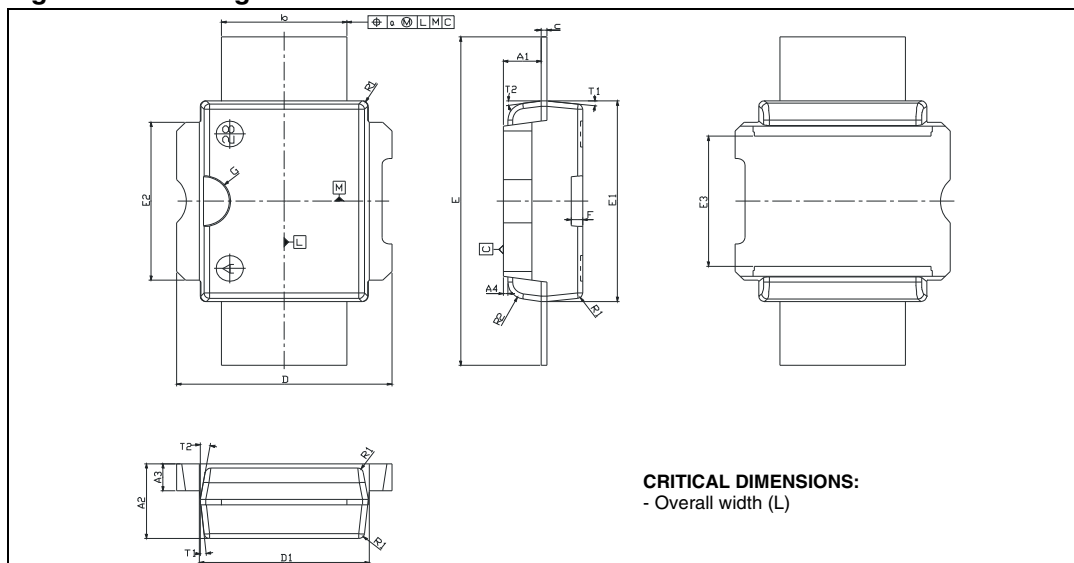
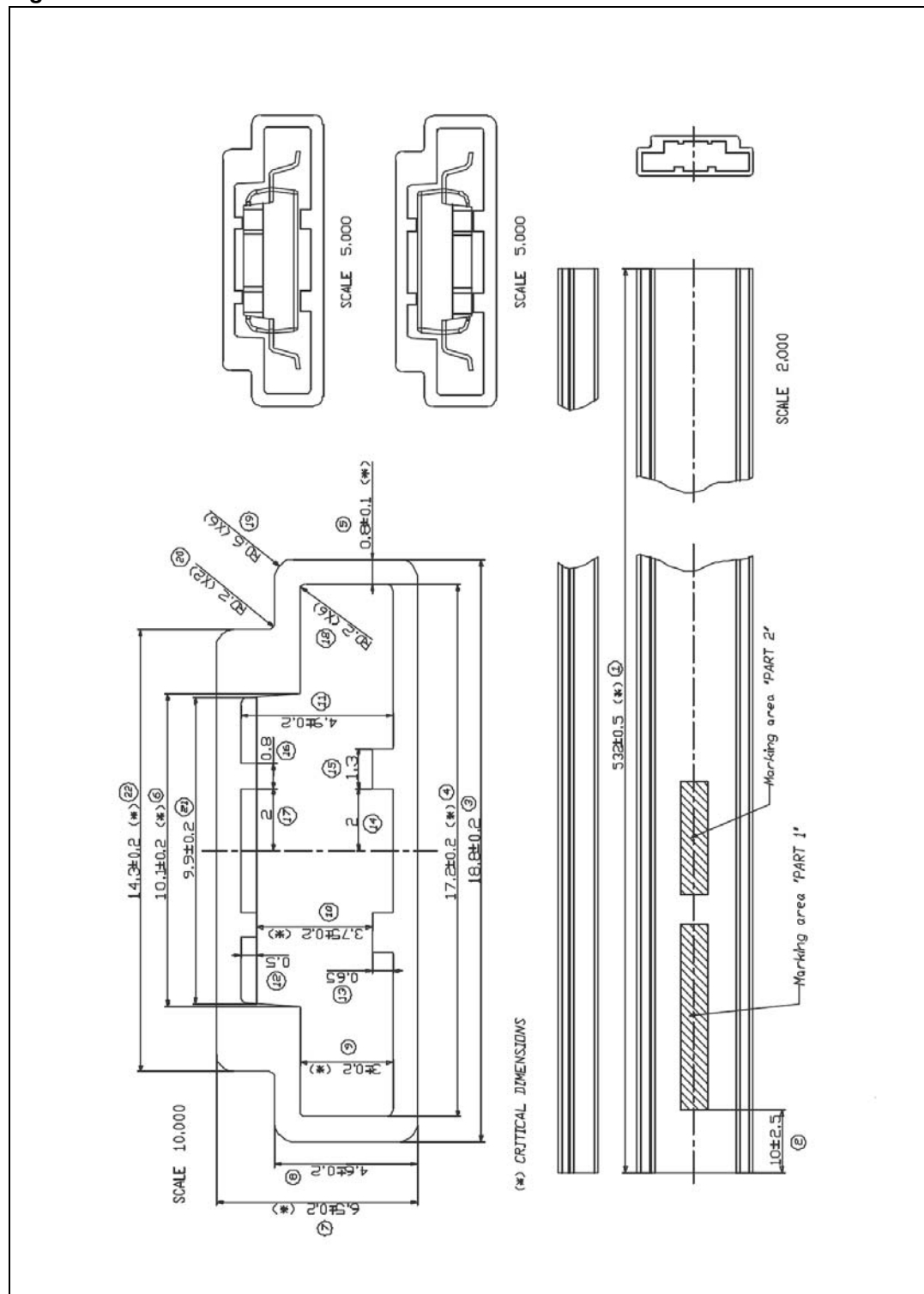


Figure 11. Tube information



A ₀	18.00 +/− 0.1
B ₀	9.80 +/− 0.1
K ₀	4.25 +/− 0.1
K ₁	3.70 +/− 0.1
F	11.50 +/− 0.1
P ₁	24.00 +/− 0.1
W	24.00 +/− 0.3

SECTION X-X

User Direction of Feed →

6 Revision history

Table 11. Document revision history

Date	Revision	Changes
14-Dec-2007	1	Initial release.
14-Apr-2009	2	Updated Table 4 on page 4 .
28-Jun-2011	3	Updated Table 4 on page 4 .
29-May-2012	4	Removed commercial type in Table 1 on page 1 .

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